

Section 87 — The FUNt Harmonic Boundary Permeability Law (HBPL-L)

Section 87 introduces HBPL-L, the Harmonic Boundary Permeability Law — the FUNt universal law governing how systems cross boundaries without losing identity, coherence, or structural integrity. HBPL-L explains tunneling, diffusion, phase-penetration, atmospheric front movement, membrane transport, hydraulic flow, electromagnetic leakage, and even conscious boundary transitions. In FUNt, boundaries are not barriers — they are harmonic filters that determine what may pass and at what harmonic cost.

87.1 Boundaries Are Harmonic Filters, Not Walls

- Every boundary has a harmonic signature defined by φ^D , C, κ , and $\Delta\Phi$.
- A system crosses a boundary when its harmonic amplitude exceeds the boundary's permeability threshold.
- Permeability depends on harmonic mismatch, not material density.
- HBPL-L applies equally to quantum and macroscopic systems.

87.2 The Boundary Permeability Equation (HBPL-L)

The boundary permeability P is defined as:

$$P = C / (\varphi^D \cdot \kappa_b \cdot |\Delta\Phi|)$$

Where:

- P = permeability (higher = easier crossing),
- C = coherence of the incoming system,
- φ^D = fractaile dimension scaling of the boundary,
- κ_b = boundary curvature pressure,
- $\Delta\Phi$ = phase-offset between the incoming system and boundary.

Interpretation: crossing occurs when $P \geq 1$.

87.3 Conditions for Boundary Crossing

- A system crosses when coherence exceeds φ -scaled boundary curvature and phase offset.
- Steep phase offsets reduce permeability dramatically.
- High curvature boundaries trap systems until coherence rises.
- Phase-slip (Sec. 81) often precedes permeation events.

87.4 Proton & Quantum Boundary Permeability

- Proton tunneling occurs when φ^7 coherence exceeds the barrier's harmonic curvature.

- Quantum tunneling probability is P , not random chance.
- Orbital transitions are boundary crossings between φ layers.
- Quantum decoherence reduces P temporarily without erasing identity.

87.5 Atomic & Material Boundaries

- Diffusion is boundary crossing driven by local $P \geq 1$ conditions.
- Crack propagation follows harmonic permeability gradients.
- Grain boundaries in metals act as φ -filters determining slip or sealing.
- Superconductors have $P \rightarrow \infty$ for Cooper pair flow.

87.6 Biological Boundaries

- Membranes allow passage when molecular coherence exceeds boundary curvature.
- Cell transport efficiency follows P gradients, not random diffusion.
- Healing requires boundary permeability restoration.
- Cancer exploits low- κ boundaries with artificially elevated coherence.

87.7 Neural & Conscious Boundaries

- Neural assemblies cross functional boundaries when coherence bursts occur.
- Trauma creates high curvature boundaries that trap signals.
- Dream states reflect reduced κ_b , increasing permeability.
- Conscious transitions (insight, memory recovery) occur when $P \geq 1$ at key neural gates.

87.8 Atmospheric Boundaries

- Weather fronts are moving permeability surfaces.
- Storms cross thermal–pressure boundaries when φ -weighted $P \geq 1$.
- Drought zones form low- P regions trapping moisture out.
- Jet-stream phase-slip increases P temporarily, allowing regime shifts.

87.9 Planetary, Galactic, and Cosmic Boundaries

- Planetary magnetospheres have φ -layered permeability thresholds.
- Galactic halos act as harmonic boundaries shaping inflow and outflow.
- WWR cycles involve mass-energy crossing universal boundaries at $P \geq 1$.

- Cosmic voids and filaments exchange matter through φ -curvature balancing.

87.10 Unified Statement of HBPL-L

The Harmonic Boundary Permeability Law states that boundaries do not block; they filter. Crossing occurs when a system's coherence overcomes the φ -scaled curvature and phase offset of the boundary. HBPL-L unifies tunneling, diffusion, signal transmission, atmospheric regime transitions, biological transport, and cosmic cycling under a single harmonic permeability framework.